

# Lockout Tagout

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## 1. Introduction

### 1.1 Incidence of Injuries

Approximately 39 million workers are protected by lockout/tagout in general industry. OSHA estimates that adherence to the requirements will

eliminate nearly 2 percent of all workplace deaths.

## **1.2 Causes of Injuries**

### **Unsafe Acts**

- o Accidentally activating an energy source that should have been locked or tagged out.
- o Failing to lockout/tagout all energy sources before work begins.
- o Turning off the wrong source of energy.
- o Not testing an energy source before work begins.
- o Not relieving stored secondary energy.

### **Unsafe Conditions**

- o No written procedures.
- o Improper labeling and identification of lockout/tagout devices.
- o Inadequate training/inspections.
- o Energy isolation devices not identified.

## 1.3 Application

Lockout/tagout is used to control energy sources during the service and maintenance of machinery or equipment when unexpected energization, start up, or release of stored energy may occur. Its purpose is to safeguard employees from injury or death. This procedure also applies when:

- o Employees are required to remove or bypass any guard, interlock, or other safety device.
- o Employees are required to place any part of their body into an area on a machine or equipment where work is being performed.

## 1.4 Basic Terms

**Affected employee.** Employees whose jobs require them to operate or use machinery or equipment that is being serviced or maintained or whose jobs require them to work in areas where service or maintenance is being

performed.

**Authorized employee.** A person who locks out or tags out machinery or equipment in order to perform service or maintenance on that machinery or equipment.

**Energy isolating device.** A mechanical device that physically prevents the transmission or release of energy. (Note: push buttons, selector switches, and other control circuit-type devices are not energy-isolating devices.)

**Energy source.** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

**Lockout device.** A device that uses a positive means (such as a key or combination lock) to hold an energy-isolating device in a safe position.

**Tagout device.** A prominent warning device, such as a tag, with means of attachment that can be securely fastened to an energy-isolating device

(see Figure 1). Refer to (OSHA) 29 CFR 1910. 147, "Control of Hazardous Energy"; the American National Standard Institute (ANSI) Z244.1-1982, "Lockout/TagoutSources"; and the Department of Energy Manual 5480.19, "Lockouts and Tagouts" for additional information and definitions.

## **1.5 Exemptions**

There are three exemptions to lockout/tagout procedures.

First, lockout/tagout does not apply to minor tool changes, adjustments, and other minor servicing activities that take place during normal operations.

The changes also have to be routine, repetitive, and integral to the use of the equipment.

Second, lockout/tagout procedures do not apply on cord and plug-connected electrical equipment if exposure to unexpected start-up is controlled by unplugging it from its energy source. The plug must also be under the exclusive control of the employee performing the servicing or maintenance.

Third, hot-tap operations involving transmission and distribution systems for utilities such as water, gas, or electrical power, do not require lockout/tagout if employers can demonstrate that

- (1) continuity of services is essential,
- (2) shutdown of the system is impractical,
- (3) documented procedures are followed, and
- (4) special equipment is used that will provide proven effective protection for employees.

## 2. Standards and Codes

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| Group | Standard | Subject |
|-------|----------|---------|
|-------|----------|---------|

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|                      |                             |
|----------------------|-----------------------------|
| OSHA 29 CFR 1910.147 | Control of hazardous energy |
| (lockout/tagout)     |                             |

|                      |  |
|----------------------|--|
| OSHA 29 CFR 1910.333 | Lock and tag requirements for electrical |
| systems              |  |

|                                  |   |
|----------------------------------|---|
| ANSI Z244.1-1982                 | For personnel protection-lockout/tagout |
| of energy sources-minimum safety |   |

## requirements

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OSHA = Occupational Safety and Health Administration.

ANSI = American National Standards Institute.

## **3. Protective Devices**

### **3.1 Selection**

Facilities should identify the requirement for tags, locks, and lockout/tagout attachment hardware and ensure an adequate supply is maintained and distributed as needed. In addition, all energy isolating devices must be adequately labeled or marked to indicate their function. The only exception is when isolating devices are located or arranged so that their purpose is evident.

### **3.2 Minimum Requirements**

When attached to an energy-isolating device, both lockout and tagout

devices protect employees from hazardous energy. The lockout device holds the energy-isolating device in a safe position to prevent the machine or equipment from unexpected start-up. The tagout device does this by identifying the energy-isolating device as a source of potential danger and indicating that the energy-isolating device and the controlled equipment may not be operated until the tagout device is removed. Whichever devices are used, they must be singularly identified, be the only devices used for controlling hazardous energy, and meet the following requirements:

**Durable.** Lockout and tagout devices must withstand the environment to which they are exposed for the maximum duration of the expected exposure. Tagout devices must be constructed and printed so that they do not deteriorate or become illegible, especially when used in corrosive (acid and alkali chemicals) or wet environments.

**Standardized.** Both lockout and tagout devices must be standardized according to either color, shape, or size. Tagout devices must also be standardized according to print and format.



**Substantial.** Lockout and tagout devices must be substantial enough to minimize accidental removal except by excessive force of special tools such as bolt cutters or other metal cutting tools. Tag attachments must be nonreusable, attachable by hand, self-locking, and nonreleasable, with a minimum unlocking strength of no less than 50 pounds.

The device for attaching the tag also must have the general design and basic characteristics equivalent to a one-piece nylon cable that will withstand all environments and conditions.

**Identifiable.** Locks and tags must clearly identify the employee who applies them. Tags must warn against hazardous conditions if the machine or equipment is energized. They should also include a legend such as: DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, or DO NOT OPERATE.

## 4. Work Practices

### 4.1 Energy Source Survey

An initial survey must identify all energy sources and related exposures in the equipment, systems, and machines. The survey will determine if adequate and appropriately located energy-isolating devices are available for positive protection. Additionally, the potential for accidents will be reduced if employees are not expected to rely on memory to determine which energy-isolating devices apply to which machines or to trace the equipment complexity.

## 4.2 No Lockout Provisions

OSHA has determined that lockout is a more reliable means of deenergizing equipment than tagout and that it should always be the preferred method

used by employees. However, if an energy-isolating device cannot be locked out, a tagout system may be used if all three of the following provisions are met:

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- o It can be demonstrated that the use of a tagout system will afford the same protection as lockout.
  - o The tagout device is attached at the same location that the lockout would have been.

- o An additional means of protection is provided, such as, isolating a circuit element or blocking a control switch.
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## **4.3 Lockout/Tagout Sequence**

Prior to implementation, all affected employees must be notified of the work to be performed under lockout/tagout. Special operating problems, unusual equipment/process modes, and factors affecting equipment/process release should be discussed. A mutual understanding with respect to scope and lockout/tagout time should exist.

## **4.4 Lockout/Tagout Application**

Simple lockout/tagout applications, such as one employee and one energy source, do not need a prepared plan. However, it is advisable to have available written listings of all equipment and the specific locations of their energy-isolating devices. For other situations,

- o Use the appropriate equipment shutdown procedures; turn off all operating controls.
- o Locate all equipment energy-isolating devices, and isolate the machine from the energy sources.
- o Use an approved lockout/tagout device to isolate each hazardous energy source.
- o Examine the equipment to detect and relieve any stored hazardous energy.
- o Verify that the energy-isolating device has produced the required results.

## **4.5 Lockout/Tagout Removal**

Before energy is restored to the equipment, an authorized employee should inspect the work area and make a personnel count. The procedure will verify that equipment components are operationally intact and the work is complete. The procedure should also ascertain that personnel are physically clear of the work area. Afterwards, each lockout/tagout device will be removed by the authorized employee who applied it. When this

employee is not available, another employee, under the direction of the

supervisor, may remove the device if:

- o The supervisor verifies that the authorized employee who applied the device is not at the facility.

- o The supervisor makes a reasonable effort to contact the authorized employee to inform him or her that the lockout/tagout device has been removed.

- o The supervisor must ensure the authorized employee is informed that his or her lockout/tagout device was removed as soon as he or she arrives at work.

## **4.6 Documentation of Lockout/Tagout**

Lockout/tagout placement, activation, and removal should be recorded, including any information relevant to their occurrence. This record should be maintained by the supervisor to ensure accuracy, completeness, and continuity of lockout/tagout protection.

## 4.7 Testing Considerations

In situations where the energy-isolating devices are locked and tagged and the equipment must be tested or positioned, the following sequence must be performed:

- o Clear the machine or equipment of all tools and materials.
- o Make sure all authorized and affected personnel are clear.
- o Remove the lock or tag according to procedures for lockout/tagout removal.
- o Energize and proceed with equipment testing.
- o Deenergize all systems and reapply energy control measures when the testing or positioning is complete.

## 4.8 Inspections

The supervisor must ensure that periodic inspections have been performed.

The audit must identify the machine or equipment where the energy-control procedure was used, the date of the inspection, the employees included in the inspection, and the name of the person who performed the inspection.

For lockout/tagout procedures, the periodic inspection must include a review between the inspector and each authorized employee (including affected employees when reviewing tagout procedures) of that employee's responsibilities under the energy control procedure being inspected.

## **4.9 Group Lockout/Tagout**

The scope of the job, the complexity of the equipment/system, or the number of personnel involved may produce situations where a more functional and practical method of lockout/tagout is used. However, when service and maintenance is performed by a crew, department, or other group, it must use a lockout/tagout procedure that still affords the employees of the group protection equal to what a single employee would receive.

## **5. Training**

### **5.1 General Training**

All lockout/tagout training programs must ensure that all employees understand the purpose, function, and restrictions of the energy control program. The supervisor shall provide training and retraining as necessary and shall certify the training has been given to all employees. There are three classifications of employees for lockout/tagout training: authorized, affected, and other. The amount and kind of training that each employee receives is based on (1) the relationship of that employee's job to the machine or equipment being locked or tagged out, and (2) the degree of knowledge relevant to hazardous energy that he or she must possess. For example, the training program for authorized employees (those who are charged with the responsibility for implementing the energy control procedures and performing the servicing or maintenance) must cover, at minimum, the following areas:

- o Details about the type and magnitude of the hazardous energy sources present in the workplace.
- o The methods and means necessary to isolate and control those energy sources (i.e., the elements of the energy-controls procedure[s]).

By contrast, affected employees (usually the machine operators or users)



and other employees (people who may be in the area) need only be able to

(1) recognize when the control procedures are being implemented, and

(2) understand the purpose of the procedure and the importance of not

attempting to start up or use the equipment that has been locked or tagged

out.

## **5.2 Retraining**

Employees should be provided retraining whenever there is a change in a

job assignment or in machines, equipment, or processes that present new

hazards.

# **6. Bibliography**

U.S. Department of Labor, Occupational Safety and Health Administration

(OSHA). 29 CFR 1910.147. The Control of Hazardous Energy.

OSHA: Washington, DC.

U.S. Department of Energy, Manual 5480.19, Chapter 9. Lockouts and Tagouts. Washington, DC.

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 29 CFR 1910.333. Lock and Tag Requirements for Electrical Systems. OSHA: Washington, DC.

National Safety Council (NSC). 1992. Accident Prevention Manual for Industrial Operations: Engineering and Technology, 10th Edition, 1992. NSC: Chicago, IL.

American National Standard Institute (ANSI) 244.1. 1982. For Personnel Protection\_Lockout/Tagout of Energy Sources-Minimum Safety Requirements. ANSI: New York.

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 1991. Publication 3120. Control of Hazardous Energy, (lockout/tagout). OSHA: Washington, DC.

Standard Number 1910.147 App A

## Title **Typical minimal lockout procedures**

### General

The following simple lockout procedure is provided to assist employers in developing their procedures so they meet the requirements of this standard. When the energy isolating devices are not lockable, tagout may be used, provided the employer complies with the provisions of the standard which require additional training and more rigorous periodic inspections. When tagout is used and the energy isolating devices are lockable, the employer must provide full employee protection and additional training and more rigorous periodic inspections are required. For more complex systems, more comprehensive procedures may need to be developed, documented, and utilized.

## **Lockout Procedure**

Lockout Procedure for

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(Name of Company for single procedure or identification of equipment if multiple procedures are used).

## **Purpose**

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

## **Compliance With This Program**

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this

procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

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Type of compliance enforcement to be taken for violation of the above.

## Sequence of Lockout

(1) Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.

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Name(s)/Job Title(s) of affected employees and how to notify.

(2) The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.

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Type(s) and magnitude(s) of energy, its hazards and the methods to control the energy.

(3) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).

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Type(s) and location(s) of machine or equipment operating controls.

(4) De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).

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Type(s) and location(s) of energy isolating devices.

(5) Lock out the energy isolating device(s) with assigned individual lock(s).

(6) Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

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Type(s) of stored energy - methods to dissipate or restrain.

(7) Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

Caution: Return operating control(s) to neutral or "off" position after verifying the isolation of the equipment.

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Method of verifying the isolation of the equipment.

(8) The machine or equipment is now locked out.

## Restoring Equipment to Service.

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

(1) Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

(2) Check the work area to ensure that all employees have been safely positioned or removed from the

area.

(3) Verify that the controls are in neutral.

(4) Remove the lockout devices and reenergize the machine or equipment.

**Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.**

(5) Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for used.

## 6. Bibliography

U.S. Department of Labor, Occupational Safety and Health Administration

(OSHA). 29 CFR 1910.147. The Control of Hazardous Energy.

OSHA: Washington, DC.

U.S. Department of Energy, Manual 5480.19, Chapter 9. Lockouts and

Tagouts. Washington, DC.

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American National Standard Institute (ANSI) 244.1. 1982. For Personnel Protection\_Lockout/Tagout of Energy Sources-Minimum Safety Requirements. ANSI: New York.

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 1991. Publication 3120. Control of Hazardous Energy, (lockout/tagout). OSHA: Washington, DC.

# Lockout/Tagout Safety Checklist

This safety checklist assists authorized employees in determining that procedures and equipment are available and personnel are trained in the

control of hazardous energy sources. This checklist only addresses the minimum required standards. Where appropriate, it may be supplemented with local site or shop-unique requirements. Relevant references are noted after each question.

Training OK Action Needed

OK Action Needed

Are all authorized employees whose job requires them -----

to perform service/maintenance on machines, systems,  
or equipment trained on lockout/tagout procedures?

29 CFR 1910.147 (c)(7)(i)

Is lockout/tagout training sufficient to ensure -----

recognition of applicable hazardous energy sources?

29 CFR 1910.147 (c)(7)(i)

Do authorized employees know the adequate methods -----

and means of isolating hazardous energy sources?



## 29 CFR 1910.147 (c)(7)(i)(A)

Are affected employees instructed by their -----  
supervisor on the purpose and use of energy control  
procedures?

## 29 CFR 1910.147 (c)(7)(i)(B)

Are all employees whose duties require them to be in -----  
an area where energy control procedures are used,  
instructed on their purpose, the prohibitions  
of lockout/tagout, and about a change in equipment  
that presents a new hazard?

## 29 CFR 1910.147 (c)(7)(iii)(A)

If random lockout/tagout inspections reveal problems, -----  
is retraining accomplished?

## 29 CFR 1910.147 (c)(7)(iii)(B)

If a supervisor has reason to suspect there are -----

inadequacies in the employee's knowledge of lockout/

tagout procedures, is retraining accomplished?

29 CFR 1910.147 (c)(7)(iii)(B)

Is lockout/tagout retraining sufficient to provide -----

employee proficiency and introduce new or revised

procedures?

29 CFR 1910.147 (c)(7)(iii)(B)

As a minimum, is lockout/tagout training recorded -----

with the employee's name, class attendance date, and

their work area?

29 CFR 1910.147 (c)(7)(iii)(C)

## Lockout/Tagout Procedures

Are lockout/tagout devices capable of withstanding -----

the environment to which they are exposed?

29 CFR 1910.147 (c)(5)(ii)(A)(1)

Are lockout/tagout devices easily recognizable and -----  
clearly visible?

29 CFR 1910.147 (c)(5)(ii)

Do locks have substantial strength to prevent -----  
removal without applying excessive force such as  
bolt cutters?

29 CFR 1910.147 (c)(5)(ii)(C)(1)

Are lockout/tagout devices standard in either shape, -----  
color, or format?

29 CFR 1910.147 (c)(5)(ii)(B)

Are tags, tag attachments, and lock attachment -----  
mechanisms designed so that the probability of  
accidental removal is minimized?

29 CFR 1910.147 (c)(5)(ii)(C)(2)

Are tag attachments self-locking and attachable -----

by hand?

29 CFR 1910.147 (c)(5)(ii)(C)(2)

Have facilities identified their requirements for -----

tags, locks, and attachment hardware, and do they

have an adequate supply on-hand?

29 CFR 1910.147 (c)(5)(i)

Has an initial survey been completed to identify -----

all primary and secondary equipment energy sources?

29 CFR 1910.147(d)(1)

Are drawings, prints, and actual inspections used to -----

assist in identifying all sources of equipment

energy?

29 CFR 1910.147 (d)(1)

If an energy isolating device is not capable of being -----  
locked out, can it be demonstrated that a tagout  
affords the adequate protection?

29 CFR 1910.147 (c)(3)(ii)(B)

If using a tagout, can an additional means of -----  
protection be provided, such as blocking a control  
switch?

29 CFR 1910.147 (c)(3)(ii)(B)

Are all energy isolating devices adequately labeled -----  
or marked to indicate their function?

29 CFR 1910.147 (d)(1)

Is all new or replacement equipment able to accept a -----  
lock device?

29 CFR 1910.147 (c)(2)(iii)

Prior to lockout/tagout implementation, are all -----  
affected employees notified of the work to be

performed?

29 CFR 1910.147(c)(9)

If equipment complexity warrants, is a special -----

lockout/tagout plan developed?

29 CFR 1910.147 (c)(4)(i)

Do affected employees review the plan of lockout/ -----

tagout sequences of complex operations?

29 CFR 1910.147 (c)(7)(i)(A)

Is there a written listing of all energy isolating -----

devices on shop equipment?

29 CFR 1910.147 (c)(4)

During lockout/tagout, are all operating controls -----

turned off by an authorized employee?

29 CFR 1910.147 (d)(1)

Is an approved lock or tag used to isolate each -----

hazardous energy source?

29 CFR 1910.147 (d)(4)(i)

Are tagouts located in such a position that they will -----

be immediately obvious to anyone attempting to

operate an energy isolating device?

29 CFR 1910.147 (c)(7)(ii)(C)

Is the equipment or system examined to detect and -----

relieve any stored hazardous energy?

29 CFR 1910.147 (d)(5)(ii)

Is the equipment or system tested to determine if -----

the operation of the energy isolation device is

working?

29 CFR 1910.147 (d)(6)

Before energy is restored, is a visual inspection -----

and personnel count of the work area conducted by an

authorized employee?

29 CFR 1910.147 (e)(1)

Is each lockout/tagout device removed by the -----

authorized employee who applied it?

29 CFR 1910.147 (e)(2)(ii)

Does the supervisor maintain a record of placement -----

and removal of lockouts/tagouts?

29 CFR 1910.147 (c)(4)(ii)(B)

## **Special Lockout/Tagout Considerations**

If a group lockout/tagout system exists, does the -----

procedure provide the same protection that a single

employee would receive?

29 CFR 1910.147 (f)(3)(i)



Is responsibility for a number of personnel working -----  
under the protection of a particular lockout/tagout  
vested with an authorized employee or  
supervisor?

29 CFR 1910.147 (f)(3)(ii)(A)

Are specific procedures established for lockout/ -----  
tagout utilization during shift change?

29 CFR 1910.147 (f)(4)

If outside contractors are working on-site, do our -----  
personnel ensure compliance with lockout/tagout  
procedures?

29 CFR 1910.147 (f)(2)

## Periodic Inspections

Are periodic inspections of lockout/tagout -----

procedure conducted at least annually?

29 CFR 1910.147 (c)(6)(i)

Are inspections conducted by a supervisor or -----

authorized employee, other than the person using the

lockout/tagout procedure?

29 CFR 1910.147 (c)(6)(i)(A)

Does the inspection include a review between the -----

inspector and the authorized/affected employees of

their responsibilities under the lockout/tagout

program?

29 CFR 1910.147 (c)(6)(i)(D)

Are inspections certified and recorded? -----

29 CFR 1910.147 (c)(6)(ii)

As a minimum, do the inspections include the date -----

of inspection, the employee and inspector names, and  
the equipment on which the lockout/tagout  
procedures are being used?

29 CFR 1910.147 (c)(6)(ii)